Write your answers in the answer blank (or circle them). Show all necessary work for full credit. Answers are to be exact values unless stated otherwise.

1. Calculate the following iterated integrals:
   (a) $\int_0^1 \int_0^1 ye^{xy}\ dxdy$

   1a. ______________

   (b) $\int_1^2 \int_0^2 (y + 2xe^y)\ dxdy$

   1b. ______________

   (c) $\int_0^1 \int_0^y \int_x^1 6xyz\ dzdxdy$

   1c. ______________

2. Convert the following equations:
   (a) $\phi = \pi/4$ to rectangular coordinates

   2a. ______________

   (b) $x^2 + y^2 = 4$ to spherical coordinates

   2b. ______________

3. Sketch the region whose area is given by $\int_0^{\pi/2} \int_0^{\sin 2\theta} r\ drd\theta$ (you may need to change the coordinate system)

4. Change the order of integration of the following: $\int_0^1 \int_{\sqrt{y}}^1 \frac{ye^{x^2}}{x^3}\ dxdy$

4. _______________

5. Express the double integrals with dA = dxdy and dydx

   (a) $\iint_D xydA$ where $D = \{(x, y)|\ 0 \le y \le 1,\ y^2 \le x \le y + 2\}$

5a. _______________

   (b) $\iint_D \frac{1}{1+x^2} dA$ where D is the triangular region with vertices (0, 0), (4, 7/3), and (6, 0)

5b. _______________

   (c) $\iint_D y\ dA$ where D is the region in the first quadrant bounded by $x = y^2$ and $x = 8 - y^2$

5c. _______________

6. Express the triple integrals with dV defined with th given orders of integration.

   (a) $\iiint_E dV$ using dV = dzdydx and dydzdx where $E = \{(x, y, z)|\ 0 \le x \le 3,\ 0 \le y \le x,\ 0 \le z \le x + y\}$

6a. _______________

   (b) $\iiint_E dV$ using dV = dzdydx and dxdydz where E is lies above $z = 0$, below $z = y$ and inside $x^2+y^2 = 4$

6b. _______________

7. Express the following as a double integral in rectangular and convert to polar coordinates:

   (a) $\iint_R (2x - y)\, dA$ where R is the region in the first quadrant enclosed by the circle $x^2 + y^2 = 4$ and the lines $x = 0$ and $y = x$

   7a. ______________

   (b) $\iint_D e^{-x^2-y^2}\, dA$ where D is the region bounded by $x = -\sqrt{4-y^2}$ and the y-axis.

   7b. ______________

   (c) $\int_0^2 \int_0^{\sqrt{2y-y^2}} \sqrt{x^2+y^2}\, dydx$

   7c. ______________

8. Find the surface area for the part of the plane $6x + 4y + 2z = 1$ that lies inside the cylinder $x^2 + y^2 = 25$

   8. ______________

9. Express as a triple integral in rectangular and convert to the indicated coordinate system.

   (a) $\iiint_E xe^{x^2+y^2+z^2}\, dV$ where E is the portion of the sphere $x^2 + y^2 + z^2 \leq 9$ that lies in the first octant. To Spherical coordinates

   9a. ______________

   (b) $\iiint_E z\, dV$ where E lies above $z = x^2 + y^2$ and below $z = 2y$. To Spherical coordinates

   9b. ______________

(c) $\iiint_E (x^2+y^2)\ dV$ where E is bounded by $z = 2 - x^2 - y^2,\ y = 0,\ z = 0,\ x^2 + y^2 = 1$. To Cylindrical coordinates.

9c. ______________

(d) $\iiint_E (x-y)\ dV$ where E solid that lies between the cylinders $x^2+y^2 = 1$ and $x^2+y^2 = 16$, above the xy-plane, and below $z = y + 4$. To Cylindrical coordinates.

9d. ______________